MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2022/2023 (TERM ID 2220)

ECE3076 – DATABASE SYSTEMS

(All Section / Groups)

8 JULY 2023
9:00 AM – 11:00 AM
(2 Hours)

INSTRUCTION TO STUDENTS

1. This examination paper consists of five (5) printed pages including the cover page with four (4) questions only.

2. Answer all questions. All questions carry equal marks (25 marks each) and the distribution of marks for each sub-question is given. The total for this paper is 100 marks.

3. Please write all your answers in the Answer Booklet provided.

Question 1

Consider the database for a library management system with the entity relationship (ER) diagram in Figure 1. Answer the following questions based on the ER diagram.

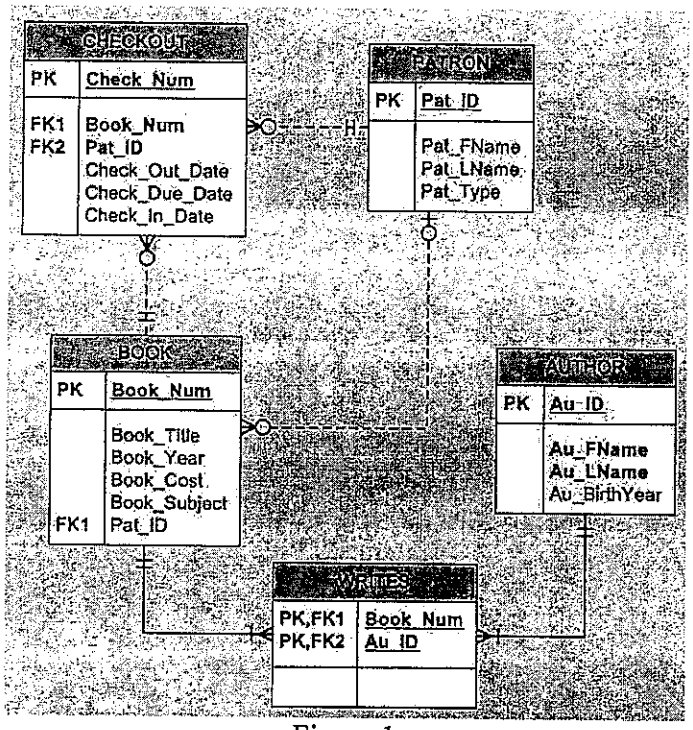

Figure 1

a) Write a query to display all rows in the PATRON table. Sort by the patron last name in ascending order. [4 marks]

b) Write a query to display the author's last name, author's first name, and book number for each book written by that author. [4 marks]

c) Write a query to display the patron ID, book number, patron's last name and book title for all books borrowed by the patron. Sort the output by patron last name in ascending order. [4 marks]

d) Write a query to display the book number and the number of times each book has been checked out. [4 marks]

e) Write a query to display the subject and average cost of books within that subject. [4 marks]

f) Define the CHECKOUT table with a SQL statement. [5 marks]

Continued...

Question 2

You are tasked to design a database for a medical geriatric clinic where the doctor visits elderly patients at their house. Using the Crow's Foot notation, create an Entity Relationship Diagram (ERD) that can be implemented on a suitable relational database management system based on the business rules shown below. You must indicate all possible connectivities in your diagram. The relationship label should be indicated on the line drawn. All many to many relationships must be resolved to ensure that the database can be implemented.

- A patient can make many appointments with one or more doctors in the clinic, and a doctor can accept appointments with many patients. However, each appointment is made with only one doctor and one patient.
- If the appointment is kept, the doctor will visit the patient on the date specified in the appointment.
- With each visit, the patient's records are updated to provide a medical history.
- Each visit creates a bill.
- A single bill can be used for many insurance claims and a single insurance claim can consist of multiple bills.

[25 marks]

Continued...

Question 3

a) Briefly describe the concept of normalization in database design. Explain the third normal form requirements.

[5 marks]

b) Explain the three anomalies that the normalization process aims to resolve.

[3 marks]

c) The diagram in Figure 2 shows the dependency diagram of a table in a relational database. Transform the table into multiple tables that satisfy the third normal form (3NF). Identify the partial and transitive dependency. Show the steps involved.

[12 marks]

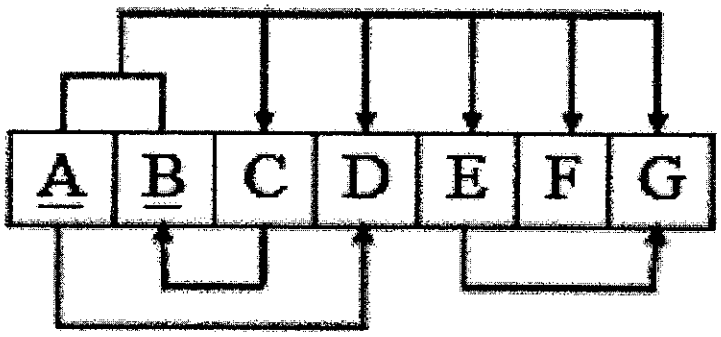

Figure 2

d) Refer to Table 3.1 and 3.2 below and explain if entity integrity and referential integrity are satisfied. The primary key is underlined. Category_ID is a foreign key in the Employee table and refers to Category_ID in Category table.

Emp_ID	Emp_Name	Category_ID (FK)
1	Cindy Khoo	NULL
1	Nelson Tan	A
2	Ahmad Rahman	A
3	Muthusamy	E
4	Mahmoud Sayid	D
5	Paul Dickson	NULL

Table 3.1: Employee Table

Category_ID	Category_Name
A	Full time
B	Part time
C	Contractor

Table 3.2: Category Table

[5 marks]

Continued...

Question 4

a) The scheduler is a DBMS component responsible for concurrency control. Two types of scheme used to avoid deadlock in concurrent database operation are the wait/die and wound/wait. Explain these two concurrency control methods.

[10 marks]

b) In Figure 3 below, transaction T1 (earlier) is holding the table **Student** and transaction T2 (at a later timestamp) is holding the table **Grade**. T1 is requesting to lock the **Grade** table to complete the transation. Explain how the scheduler can use the wound/wait scheme to break the deadlock.

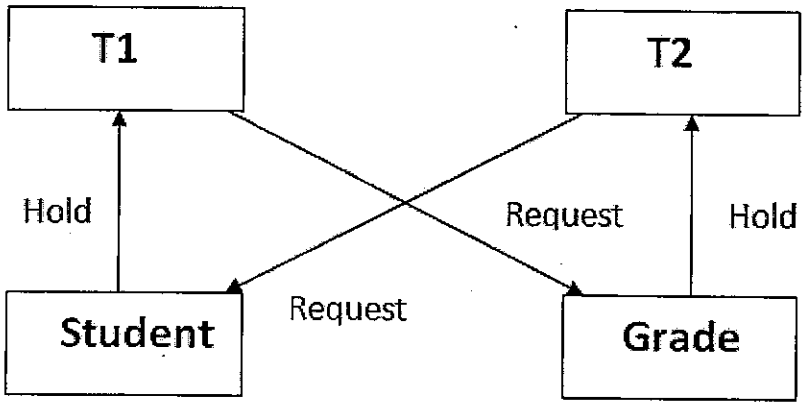

Figure 3

[3 marks]

c) What are the different levels of lock granularity? By giving suitable justification, explain which level is the most and least efficient for supporting concurrent database operations.

[4 marks]

d) Describe the difference between the NoSQL and relational database. Give four types of NoSQL databases..

[8 marks]

End of paper